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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/702,234

11/06/2003

Rajesh Khamankar

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03/09/2006

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EXAMINER

HA, NATHAN W

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 03/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/702,234

Applicant(s)

KHAMANKAR ET AL.

Examiner

Nathan W. Ha

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2005.
 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
 4a) Of the above claim(s) 9-11 is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 1-8 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date _____.
 4) ☐ Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.
 5) ☐ Notice of Informal Patent Application (PTO-152)
 6) ☐ Other: _____.

DETAILED ACTION

The previous final office action is withdrawn in view of the newly discovered reference(s) to Niimi and Chau. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3 and 6-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Niimi et al. (US 2004/0067619, newly cited, hereinafter, Niimi.)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

In regard to claims 1, 6 and 7, in figs. 5-14, Niimi discloses a method for forming MOS transistor gate dielectrics, comprising:

- providing a semiconductor substrate 50;
- forming a first dielectric layer 54 on said semiconductor substrate;
- performing a first plasma nitridation 100 of said first dielectric layer (fig. 6);
- removing said first dielectric from a region of said substrate (fig. 11);
- forming a second dielectric layer 64 on said semiconductor substrate in said region from which said first dielectric layer were removed; and
- simultaneously performing a second plasma nitridation 140, of said second dielectric layer and said first dielectric layer (fig. 14).

In regard to claims 2 and 3, the oxide layers as mentioned above are silicon oxide. Silicon Oxide is generally mentioned in a gate of a transistor as oxide (see paragraph [0037].)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 4-5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Niimi as applied to claims 1-3 and 6-7 above, and further in view of Chau et al. (U.S. Patent No. 6,087,236, previously cited, hereinafter, Chau, '236.)

In regard to claims 4-5 and 8, Niimi is shown to teach all the claimed limitations as mentioned above with the exception of incorporating 5-15 and 5-20 atomic percent in the plasma nitridation into the dielectric layers.

Chau, in figs. 15-18, discloses an analogous device including a substrate 102, double gate oxides 106 and 115 formed by nitridation process (col. 5, lines 44-55) the teaching further includes a step of incorporating less than 3 to 30 atomic percent of nitrogen into the dielectric layer (110) by simultaneously exposing the third dielectric layer and the second dielectric layer (106) to a nitrogen containing plasma (see Fig. 8, col. 5, 33-45 and col. 6, lines 47-65). These percentages are appropriately close to the range of the percentages as claimed.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to incorporate nitrogen into the dielectric layer of Niimi as taught by Chau to form devices of different characteristics in a substrate, CMOS, since the concentration of the nitrogen plays an importance role in the step of making the dielectric layer, for example, the layer's characteristics, which controls the threshold voltage since nitrogen prevents "holes" from penetrating into the layer.

Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature

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between 40°C and 80°C and an acid concentration between 25% and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid concentration of 10%.)

5. Claims 1-3 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chau et al. (US 6,597,046, newly cited, hereinafter, Chau.)

In regard to claims 1, 6 and 7, in figs. 1-8, Niimi discloses a method for forming MOS transistor gate dielectrics, comprising:

- providing a semiconductor substrate 102;
- forming a first dielectric layer 106 on said semiconductor substrate;
- performing a first plasma nitridation of said first dielectric layer (col. 5, lines 17-21);
- removing said first dielectric from a region of said substrate (fig. 4);
- forming a second dielectric layer 110 on said semiconductor substrate in said region from which said first dielectric layer were removed; and
- performing a second plasma nitridation of said second dielectric layer and said first dielectric layer (fig.8).

Chau, however, does not expressly disclose that the second plasma process is formed simultaneously with the first dielectric layer, but Chau further teaches that the second nitration is formed as discussed in fig.3, and there is no indication showing that the nitration layer 11, for example, if separately formed, as shown in fig. 8. By observing

the process of forming the second plasma process, it is obvious that this process covers the first and second dielectric layer.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to recognize the process of the second plasma step is formed at the same time and covers the two dielectric layers in order to exclude a masking step.

In regard to claims 2 and 3, the oxide layers as mentioned above are silicon oxide. Silicon Oxide is generally mentioned in a gate of a transistor as oxide (see col. 5, lines 20-25.)

6. Claims 4-5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chau as applied to claims 1-3 and 6-7 above, and further in view of Chau,'236, mentioned above).

In regard to claims 4-5 and 8, see the discussions above regarding to the atomic percentage of the nitrogen concentration.

Response to Arguments

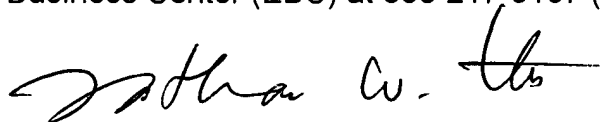
7. Applicant's arguments with respect to claims 1-8 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan W. Ha whose telephone number is (571) 272-1707. The examiner can normally be reached on M-TH 8:00-7:00(EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Nathan W. Ha". The signature is fluid and cursive, with a long horizontal stroke at the end.

Nathan Ha
March 5, 2006